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NOTE BY PROF. JOHNSON.—The following formula in Spherical Trigonometry is not to be found in any treatise I have seen.

$$\frac{\sin^2 A}{\sin^2 a} = \frac{\sin^2 B}{\sin^2 b} = \frac{\sin^2 C}{\sin^2 c} = \frac{1+\cos A\cos B\cos C}{1-\cos a\cos b\cos c}.$$

The proof is very simple; from the usual formulæ we have

$$\cos^2 a = \cos a\cos b\cos c + \sin b\sin c\cos A\cos a\,;$$

adding $\sin^2 a$ and transposing,

$$1 - \cos a\cos b\cos c = \sin^2 a + \sin b\sin c\cos A\cos a; \qquad (1)$$

also $\cos^2 A = -\cos A\cos B\cos C + \sin B\sin C\cos a\cos A$,

whence $1 + \cos A\cos B\cos C = \sin^2 A + \sin B\sin C\cos a\cos A. \qquad (2)$

Dividing (2) by (1), we have the formula.

PROBLEMS.

401. *By M. Updegraff, Madison, Wis.*—If two triang's are so situated that the three lines drawn thro' their corresponding vertices meet in a point, then will the corresponding sides produced meet in three points which lie on the same straight line.

402. *By Prof. W. P. Casey.*—Upon two sides of a triangle, describe equilateral triangles, and upon the same two sides, but in the opposite direction, describe two others, and let O, O_1 be the centres of the inscribed circles in the first pair and P, P_1 those of the second pair. It is required to prove, geometrically, that the sum of the squares of the sides of the triangle $= 3(OO_1)^2 + 3(PP_1)^2$.

403. *By Prof. W. W. Johnson.*—If, from the centre C of an equilat'l hyperbola, CA be drawn bisecting the angle between the axis and an asymptote, and the chord AB be drawn perpendicular to CA; then $AB = 2CA$.

404. *By Prof. M. L. Comstock.*—A heavy triangle ABC is suspended from a point by three strings, mutually at right angles, attached to the angular points of the triangle; if θ be the inclination of the triangle to the horizon in its position of equilibrium, then

$$\cos\theta = \frac{3}{\sqrt{(1+\sec A\sec B\sec C)}}.$$

(Todhunter's Analytical Statics, page 81.)

405. *By Prof. C. A. Van Velzer.*—Prove that a determinant which vanishes may be transformed into one having, at the same time, two identical rows *and* two identical columns.